THE
DESCRIPTION and *USES*

Of the General

HOROLOGICAL-RING:

OR

Universal Ring-Dyal.

BEING

The invention of the late Reverend Mr. *W. Oughtred*, as it is usually made of a portable pocket size. With a large and correct *Table* of the *Latitudes* of the principal Places in every Shire throughout *England* and *Wales*, *&c.* And several ways to find a Meridian-line for the setting a *Horizontal Dyal.*

By *HENRY WYNNE*, Maker of *Mathematical Instruments* near the *Sugar-loaf* in *Chancery-lane.*

London, Printed by *A. Godbid* and *J. Playford*, for the Author, 1682.

E
XII
I
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80
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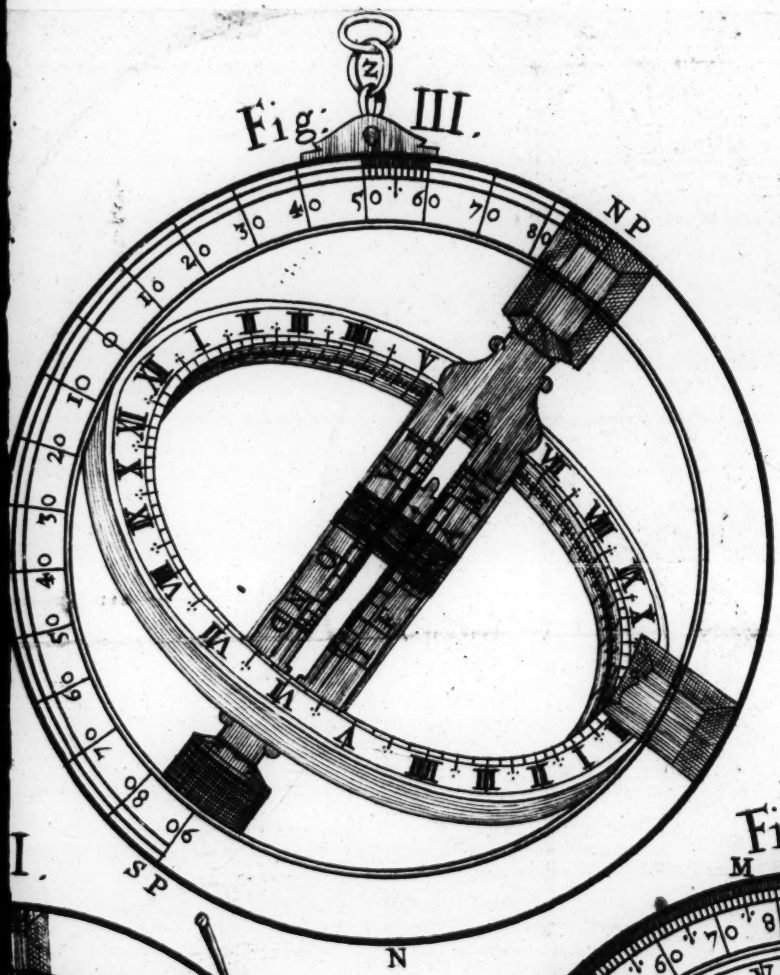
Fig. III.



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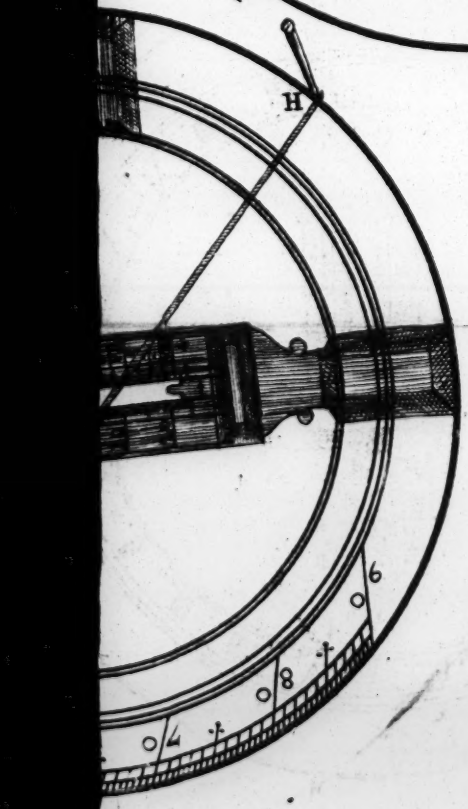
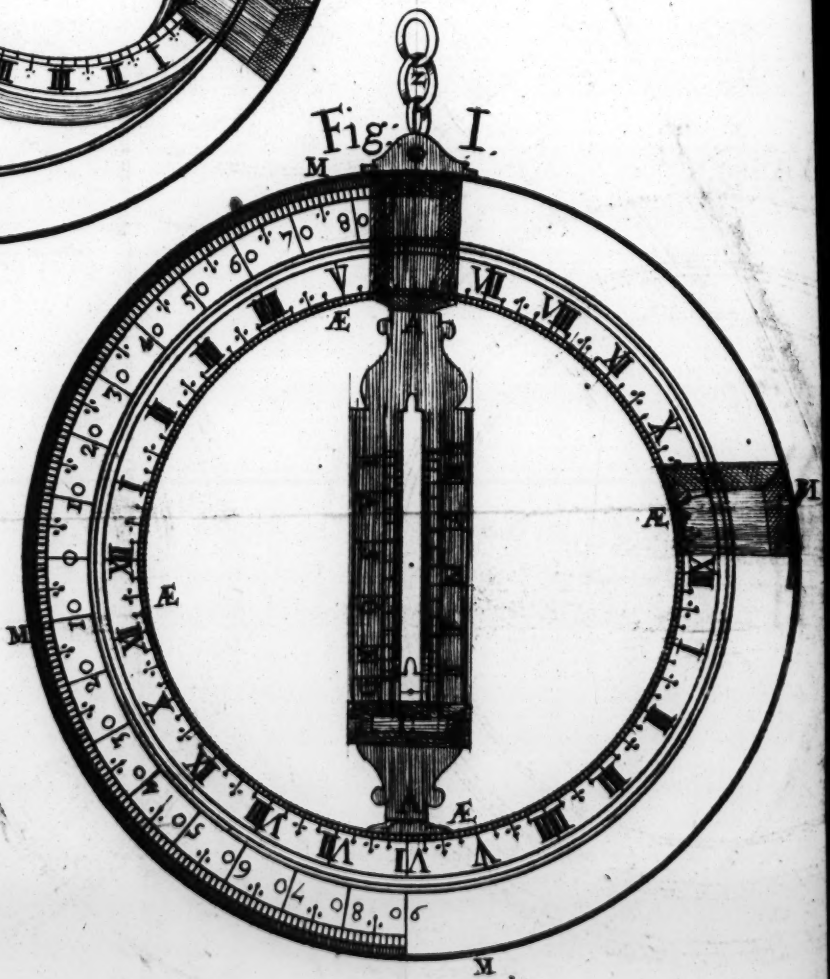


Fig. I.



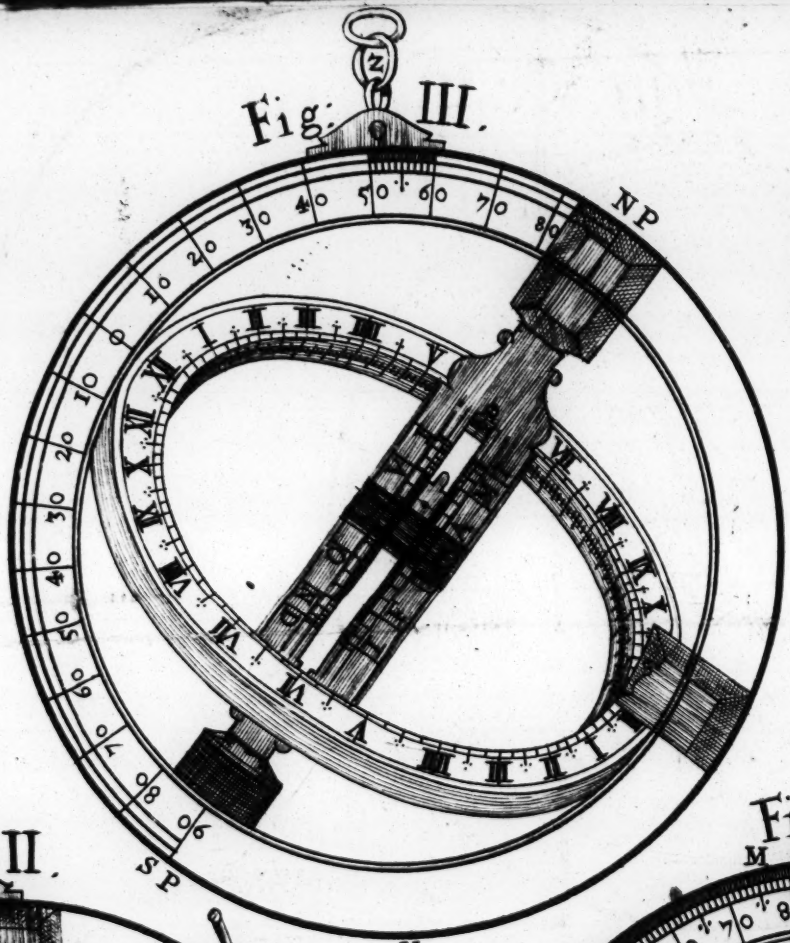


Fig. III.
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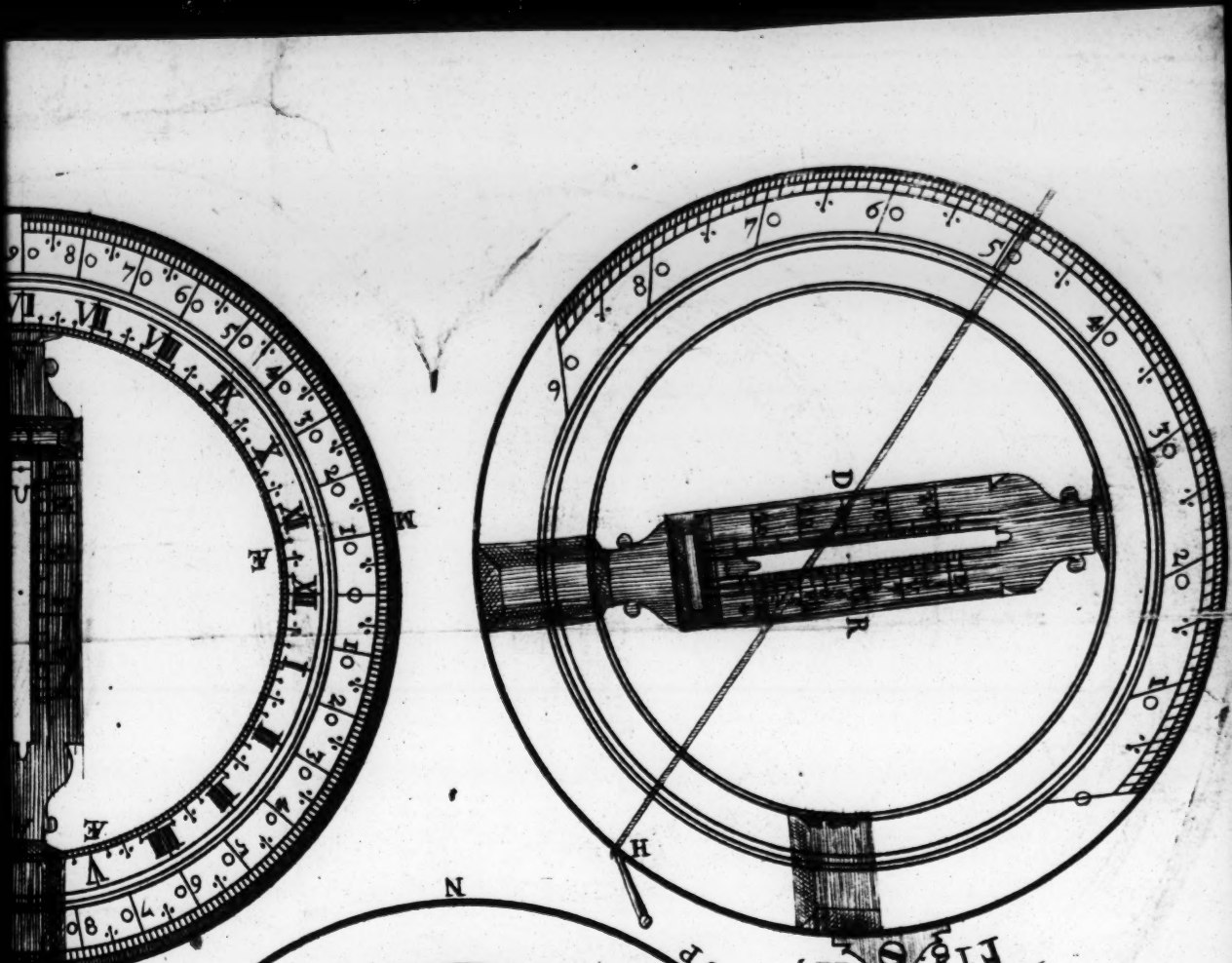
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TO THE
READER.

I Formerly publiſhed half a Sheet on this Subject, and having diſpoſed of all I printed, I found my ſelf neceſſitated to Print more, to gratify thoſe who bought the Inſtruments of me, but conſidering with my ſelf the ſcantineſs of that paper, I took the pains to write a larger which ſhould be more effectual, and as I hope will give better ſatisfaction. 'Tis confeſt that there is very little new in this (as in moſt other Books written now a days) but what may be found among former Authors. My chiefeſt care herein hath been to collect and alter ſo that it might verſe

ſerve my preſent purpoſe. As for the Inſtrument *it ſelf, being carefully made and graduated as is here deſcribed, I know of none for Portableneſs, Univerſality, and exactneſs, that doth exceed it, I mean with reſpect to its finding the hour, whereby it becomes abſolutely uſeful for any Gentleman to carry in his pocket, or to rectify his Watch or Pendulum by it,* &c. *I have endeavoured to be as plain as poſſible for the ſake of young beginners, that the reading of this might Create in ſome a farther Inclination to the* Mathematicks, *which I heartily wiſh may flouriſh not only as they are my Trade, and conſequently it is my Intereſt to promote them, but becauſe they are of ſo great and general uſe and advantage to the Kingdom.*

H. W.

THE

THE
DESCRIPTION and USES
Of the General
HOROLOGICAL RING:
OR
Universal Ring-Dyal.

1. *Of the Name.*

THis Inſtrument ſerveth as a *Dyal* to find the hour of the day, not in one place only (as moſt ſorts of *Dyals* do) but generally in all Countries whether *Northern* or *Southern*; and therefore it is called *the General Horological Ring*, or *Univerſal Ring-Dyal.*

2. *The Parts.*

It conſiſts of theſe parts, *viz.* 1. A little Ring and its ſlider to hang it by. 2. Two circles which fold one within the other. 3. A *Diameter* a croſs in the middle. 4. To this *Diameter* there is another ſlider.

3. *The Name of each part.*

The names given to the parts are: 1. The little Ring and its ſlider is called the *Curſor* of the Meridian, and is repreſented (figl.) by the letter *Z*. 2. Of the two Circles, the outermoſt *M M M M*, is called the *Meridian*, and the innermoſt *Æ Æ Æ Æ*, is called the *Æquinoctial*. 3. That which croſſeth the middle noted with *A A* is called the *Bridge*, or more properly the *Axis*. 4. The *ſlider* within it noted *C* is called the *Curſor* of the *Bridge* or *Axis*.

4. *The Diviſions on each part.*

One ſide of this Inſtrument according to *fig.* 1. is thus divided. 1. The *Curſor* of the *Meridian* hath but one diviſion or Notch as at O. 2. One half of the *Meridian* is divided into twice 90 degrees, which are again ſubdivided into halfs, and theſe halfs are diſtinguiſhed from the Degrees, by a ſhorter line, theſe Degrees are numbered at every ten, from their middle O both wayes, by 10, 20, 30, *&c.* to 90, and in theſe Degrees are the Latitudes of places reckoned when you would find the hour of the day. 3. The *Æquinoctial* is divided into

24 hours, and each hour is ſubdivided into eight parts, *viz.* halfs, quarters, and half quarters, and ſome of them have the hours divided into 12 parts, and then every diviſion ſtands for five Minutes of time, whereof 60 make one hour, theſe hours are numbred with I. II. III. *&c.* to twice XII. from the two oppoſite points in the *Meridian* where this Circle is faſtned. 4. On this ſide the *Axis* is divided into months and dayes, every diviſion expreſſing 2 days, except in *June* and *December*, at which time the alteration of the Suns courſe is almoſt inſenſible for ſeveral days together, theſe Months are known on one ſide the ſlit by theſe Letters, *I. F. M. A. M. I.* Signifying, *January*, *February*, *March*, *April*, *May*, *June*, on the other ſide by theſe, *I. A. S. O. N. D.* for *July*, *Auguſt*, *September*, *October*, *November*, *December*. 5. The *Curſor* of the *Axis* hath a little hole through it and a line a croſs the hole, which line when it is uſed is to be ſet to the day of the Month.

The other ſide according to *figure* II. hath only the *Meridian* and the *Axis* divided. 1. The *Meridian* hath a quadrant or 90 Degrees divided on it, whoſe center is at *H.* Theſe Degrees are again ſubdivided into halfs, and this I call the *Quadrant of Altitudes*, it ſerving to give the Altitude of the Sun, by the ſhadow of a

pin,

pin, or ſuch like wire, which ſhall be ſtuck upwright in the Center or hole *H*. 2. The *Axis* on that ſide the ſlit *D* is divided into twice $23\frac{1}{2}$ and numbred both ways from the middle ☉ by 10,20,*&c* and this is called the *Line of Declination*, its uſe being to give the Declination of the ☉,*&c*. On the other ſide the ſlit *R*, are divided four hours and a half, which are again ſubdivided, Numbred by $\frac{\text{IIII}}{8}\ \frac{\text{V}}{7}\ \frac{\text{VI}}{6}\ \frac{\text{VII}}{5}\ \frac{\text{VIII}}{4}$ and this line is to ſhew the Sun's riſing and ſetting at *London*, but becauſe it is particular this Line is left out in moſt Dyals. The Curſor on this ſide as on the other hath the little hole and a line a croſs it.

Beſides theſe diviſions on each ſide, on the inſide the Æquinoctial, in the middle, is a Line upon which is graduated the 24 hours, and parts agreeable to thoſe on the ſide deſcribed in *fig* I.

Note that the Inſtrument thus made is general, and will ſerve whereſoever you are, and therefore moſt proper for Seamen and thoſe that Travel far. But for ſuch as ſhall uſe them about theſe his Majeſties Dominions, it will be ſufficient to have but one Quadrant of Latitudes graduated, and no more than 18 hours or thereabouts, *viz*. from 3 in the morning to 9

at

at night, and then the Inſtrument may be afforded ſo much the cheaper.

Uſes of the Inſtrument.

THe Principal Uſes of this Inſtrument (although larger may be made to perform many more) are as followeth.

1. Knowing the day of the month to find the Suns Declination.

2. To find the Altitude of the Sun at the Meridian and all Hours.

3. By knowing the Suns Declination and Meridian Altitude, to find the Latitude of any place.

4. To find the hour of the day.

5. To find at what time the Sun riſes and ſets on any day at *London* or any other place lying under the ſame Latitude.

6. To find what days and nights throughout the year are equal.

Use I.

To get the Suns Declination by knowing first the day of the month.

Explanation.

THe Sun moves not alwayes in the Æquinoctial, but Declines from it ſometimes toward the North, and ſometimes towards the South, every day, either moving in it or in a Circle parallel to it, this diverſity of motion is called the *Suns Declination*, now about the 10 day of *March* and 13 of *September* the Suns courſe is in the Æquinoctial, and then he is ſaid to have no declination, and from the 10 of *March* to the 13 of *September*, the Sun moves on the North ſide the Æquinoctial, and it is called his *Northern Declination*, alſo from the 13 of *September* to the 10 of *March* his motion being on the South ſide, is called *Southern Declination*. By this variety of the Suns motion, is cauſed the diverſity of Seaſons and inequalities of day and night. Note alſo, that the greateſt declination on either ſide exceeds not 23 Degrees and $\frac{1}{2}$. Now to find it,

The Rule is:

Slide the Curſor of the Axis to the day of the

e month, and then turn it on the other ſide, d the diviſion croſſing the ſame hole will ew the Suns Declination in the Line *D.* te that the Axis may be turned without tur- g the whole Dyal.

Example 1.

March the 10, I ſlide the Curſor to the day of e month, and turning the other ſide, the di- ion ſtands at O, which ſhews the Sun hath no clination that day, but moves in the Æ- inoctial.

Example 2.

April the 8, I ſlide the Curſor to the day of : month, and turning the other ſide, the diviſi- ſhews 11 Degrees to be the Suns declination that day Northward.

Example 3.

October the 20, the Curſor being ſet to the y, on the other ſide it will ſhew 14 Deg. for Suns declination on that day to the uthward.

Uſe

Use I.

To get the Suns Declination by knowing first the day of the month.

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THe Sun moves not alwayes in the Æqui noctial, but Declines from it ſometime toward the North, and ſometimes towards th South, every day, either moving in it or in Circle parallel to it, this diverſity of motion called the *Suns Declination*, now about th 10 day of *March* and 13 of *September* the Sun courſe is in the Æquinoctial, and then he is ſai to have no declination, and from the 10 o *March* to the 13 of *September*, the Sun move on the North ſide the Æquinoctial, and it called his *Northern Declination*, alſo from th 13 of *September* to the 10 of *March* his motio being on the South ſide, is called *Southern Decl nation*. By this variety of the Suns motion, cauſed the diverſity of Seaſons and inequaliti of day and night. Note alſo, that the greate declination on either ſide exceeds not 23 D grees and $\frac{1}{2}$. Now to find it,

The Rule is:

Slide the Curſor of the Axis to the day th

the month, and then turn it on the other ſide, and the diviſion croſſing the ſame hole will ſhew the Suns Declination in the Line *D*. Note that the Axis may be turned without turning the whole Dyal.

Example 1.

March the 10, I ſlide the Curſor to the day of the month, and turning the other ſide, the diviſion ſtands at O, which ſhews the Sun hath no Declination that day, but moves in the Æquinoctial.

Example 2.

April the 8, I ſlide the Curſor to the day of the month, and turning the other ſide, the diviſion ſhews 11 Degrees to be the Suns declination on that day Northward.

Example 3.

October the 20, the Curſor being ſet to the day, on the other ſide it will ſhew 14 Deg. for the Suns declination on that day to the Southward.

Use II.

To find the Suns Altitude on the Meridian and all Hours.

Explanation.

THe Altitude or height of the Sun is the the number of deg. contained between the middle or Center of the Sun, and the Horizon or Circle which bounds our sight, and the Meridian Altitude is its height every day just at 12 a Clock, the Sun at that time coming to touch the Meridian. To find it,

The Rule is:

When the Sun shines slide the division on the Cursor of the Meridian to the beginning of the Degrees in *fig.* I. marked with ☉, then turn the Dyal and stick a wire or pin upright in the hole *H*, *fig.* II. and holding it by the little Ring turn it gently towards the Sun, so that the shadow of the Pin may fall among the Degrees in the Quadrant of the Altitudes, now the Deg. whereon the shadow falleth is the Suns Altitude at that time, but to know the Meridian Altitude you must observe the Suns height just at 12, now that you may be sure to have it right

right make ſeveral obſervations juſt about 12, and the greateſt is the trueſt, for as the Sun all the morning from its riſing grows higher and higher untill it comes to the Meridian where it is higheſt, ſo having paſt the Meridian, all the Afternoon it grows lower and lower untill it ſets: Wherefore the Suns greateſt Altitude on any day is the Meridian Altitude for that day.

Examples.

		deg.	m.
March the 10*th.*	the Suns Meridian	38	28
April the 8*th.*	Altitude, at *London*	49	28
October the 20*th.*	will be found by the	24	28
June the 11*th.*	foregoing Rule to be	61	58

Now before I proceed further to ſhew the uſes, it will be neceſſary to explain ſome terms in Aſtronomy, ſuch as I ſhall here make uſe of, that the young Practitioner may with more eaſe underſtand what follows.

1. *Degrees and Minutes.*

And firſt what is meant by Degrees and Minutes. All Circles according to Aſtronomy are conceived to be divided into 360 parts, which are called Degrees, every Degree is ſubdivided into 60 Minutes, every Minute into 60

Seconds, *&c.* So that one Degree is the three hundred and sixtieth part of a Circle, and one Minute the 60th part of a Degree, *&c.* Now the whole Circle containing 360 Degrees, the half must contain 180 deg. the Quadrant, or quarter part of a Circle, contains 90 deg. so likewise one deg. containing 60 Minutes, 45 Min. are 3 quarters, 30 Min. are one half, 20 Min. one third part, 15 Min. are one quarter, 12 Min. are one 5 part, 10 Min. are one 6 part, 5 Min. are one 12 part, *&c.* On the Meridian of the Dyal *Fig.* I. there are two Quadrants, or twice 90 Deg. graduated, one of which next *N P* is called the Northern Quadrant of Latitudes, and serves for those places whose Latitudes are on the North side the Æquinoctial, the other is the Southern Quadrant, and serves in South Latitudes.

2. *Meridian.*

It is a great Circle imagined in the Heavens, lying directly North and South, dividing them into two equal parts, the Eastern and Western, passing through both Poles, and the Zenith and Nadir; to this Circle when the Sun cometh at all times it is noon or midnight, and note that every place hath a several Meridian, except such

ſuch as ly directly North and South one from the other.

3. *Poles.*

The *Poles* are two imagined points in the Heavens oppoſite to each other, one North the other South.

4. *Axis.*

A Right Line imagined to run from one Pole to the other, is called the *Axis.*

5. *Zenith.*

The *Zenith* or Vertex is the Point in the Heavens directly over our heads.

6. *Nadir.*

The *Nadir* is the oppoſite Point to the *Zenith*, it being directly under our feet.

7. *Equinoctial.*

The *Equinoctial* is a great Circle imagined to run directly Eaſt and Weſt, it exactly croſſeth the Meridian, and lyeth in the middle between the Poles, and divideth the Heavens into two equal parts, the Northern and Southern, when

the Sun moves in this Circle, which is twice a year, the days and nights are of an equal length throughout the world.

8. *Tropicks.*

The *Tropicks* are two lesser Circles dividing the Heavens into two unequal parts, they are Parallel to the Equinoctial, and distant from it 23 deg. 30 min. one on the North side of it the other on the South, these Circles are the utmost bounds of the Suns Declination.

9. *Latitude and Elevation of the Pole.*

The Latitude of any [illegible] is the Number of Degrees contained between the *Zenith* of that place and the Æquinoctial, which Degrees are counted in the Meridian, either on the North or South side of the Æquinoctial, according as the place is situated. This Latitude is always equal to the elevation of the Pole, which is the number of Degrees in the Meridian contained between the Pole and the Horizon; thus those that live under the Æquinoctial are said to have no Latitude, and those that live under the Pole, if any such there be, are in 90 Deg. of Latitude; hence also it is manifest, that those places which are situate directly East and West one from the other, have one and the same Latitude.

10. *Colatitude.*

10. *Colatitude.*

The Compliment of the Latitude is the number of degrees contained between the Zenith and the Pole, which is alſo the ſame with the diſtance between the Æquinoctial and the Horizon, or it is ſo much as the Latitude wants of 90 Deg. for ſubtract the Latitude from 90, the remainder is the *Colatitude.*

Use. III.

By knowing the Suns Declination and Meridian Altitude to find the Latitude.

The Rule.

IF the Suns declination be North, ſubtract it from the Meridian Altitude, and the remainder is the Colatitude, but if the Suns Declination be South add it to the Meridian Altitude, and the Sum ſhall be the Colatitude, which ſubtracted again from 90 Deg. the remainder is the Latitude.

Example 1.

March the 10. the Sun hath no Declination, and I find the Meridian Altitude at *London*, to be 38 deg. 28 min. therefore 38 deg. 28 min. ſubtracted from 90 deg. the remainder is 51 d. 32 m. the Latitude of *London*, and by this we ſee when the Sun is in the Æquinoctial, its Meridian Altitude is equal to the Compliment of the Latitude.

Example 2.

April the 8. the Suns declination is 11 deg. North and its Meridian Altitude 49 deg. 28 m. now ſubtract 11 deg. from 49. 28. there reſts 38 deg. 28 min. which ſubtracted again from 90 there reſts 51 deg. 32. min. the Latitude required.

Example 3.

October the 20. the Suns Declination is 14 d. South, and the Meridian Altitude is 24 d. 28 m. then add 14 d. to 24 d. 28 m. the ſum is 38 d. 28 m. which ſubtracted from 90 d. there reſts 51 d. 32 m. as before.

Example

Example 4.

Thus if the declination were 23 d. 30. m. North and the Meridian Altitude 65 d. 10 m. the Latitude would be found to be 48 d. 20 m.

Example 5.

Let the Declination be 12 d. 15 m. South, and the Meridian Altitude 39 d. 40 m. the Lat. would be 38d. 5 m. Note that theſe Rules hold good only for finding the Latitudes of ſuch places as ly to the North of the Æquinoctial, for South Lat. the contrary are true, for there if the declination be North, you muſt add it as you do now when it is South, and if the Suns Declination be South, you muſt ſubtract it as you do here when it is North.

And leaſt it be thought troubleſome to find the Lat. there is added at the end of this Book a Table of the Latitudes of the principal Places in *England*, *Scotland*, and *Ireland*. So that being near any of thoſe places you may make uſe of the Lat. of that place, for 10 or 20 miles in this caſe will make a very inſenſible or no Alteration.

Use IV.

To find the Hour of the day.

NOte that although the Equinoctial fold up within the Meridian to render the Instrument the more portable, yet when you would find the hour, the Æquinoctial must be drawn forth according to *fig.* III. and 'tis a little Ray or speck of light that coming through the hole of the Cursor of the Axis falleth upon the line in the middle of the Æquinoctial and sheweth the hour.

The Rule.

First the Latitude being got by the foregoing Rules, or by the Table at the end of this book, slide the division on the Cursor of the Meridian to it, either in the North or South Quadrants, according as the place is situated. Secondly slide the Cursor of the Axis to the day of the month. Thirdly open the Equinox as far as 'twill go, which is just to cross the Meridian, then guess as near as you can at the hour, and turn the Axis towards the hour you guess, that the Sun may the better shine through the hole, and holding the Instrument by the little ring so that it may hang freely, move it gently this way and that, till the Sun shining through the hole you

can

can diſcern a little Ray or ſpeck of light to fall upon the Æquinoctial within ſide among the hours and parts, now the point in the middle line whereon the Ray falleth is the true hour. A little practice will make it very eaſie. *Fi.*III. repreſenteth the Dyal as it is when you would find the hour, where the Curſor *Z* is ſet to the Lat. of *London*, 51 32. the Curſor of the Axis is ſet to the day being *April* the 8, and the Æquinox is drawn open to croſs the Meridian. Now when the Dyal is thus ſet, and ſhews the true hour, the Meridian of it hangeth directly North and South, according to that imagined in the Heavens, the point *N P* repreſents the North Pole, *S P* Repreſents the South, the Curſor *Z* Repreſents the Zenith, and its oppoſite point *N* repreſents the Nadir; the Axis lyeth according to that of the World paſſing from Pole to Pole, the points of VI and VI in the Æquinoctial ly directly Eaſt and Weſt, and the middle line within lyeth according to the true Æquinoctial in the Heavens.

Use V.

To find the Suns Riſing and Setting.

NOte this line of Riſing and ſetting is particularly for the Latitude of *London*, or any other place ſituated directly Eaſt or Weſt from

from it, but it may indifferently ſerve the whole Kingdom. Note alſo that the great figures ſtand for the Riſing and the other for the ſetting.

The Rule.

Slide the Curſor of the Axis to the day of the Month, then turn the other ſide, and the diviſion croſſing the hole, ſhews the Suns Riſing, and Setting in the line R.

Example 1.

I ſlide the Curſor to *March* the 10, and on the other ſide it ſhews VI. and 6, for then the Sun riſes at 6 and ſets at 6.

Example 2.

April the 8, I ſet the Curſor to the day, and on the other ſide it ſhews V. and 7, which is 5 for the Suns Riſing and 7 for its Setting.

Example 3.

October the 20, the Curſor being ſet to the day, on the other ſide it will ſhew the Riſing to be at a quarter after VII, and the Setting three quarters after 4.

Now having found the Suns Riſing and Setting, you may likewiſe from thence find the length of the day and night, for double the time of the Suns Riſing, and you have the length of

of the Night, and double the time of its ſetting, gives you the length of the Day, as will appear by the three following Examples.

Example 1.

March the 10, the Sun riſes at 6 and ſets at 6, now twice 6 is twelve for the length both of day and night.

Example 2.

April the 8, the Sun riſes at 5 and ſets at 7, now twice 5 is 10 the length of the Night, and twice 7 is 14 the length of the day.

Example 3.

October the 20, The Sun riſes at a quarter after 7 and ſets at 3 quarters after 4, now twice 7 and a quarter is 14 and a half for the length of the Night, and twice 4 and 3 quarters is 9 and an half for the lenghth of the day; in all which Examples it appears that both the ſums of the length of the day and night being added together will make 24, the hours contained in a natural day.

USE VI.

To find what days and Nights throughout the year are Equal.

The Rule.

THE Days on one ſide the ſlit are equal to the days on the other. *Example*

Example.

Slide the Curſor to *March* the 10, and the day equal to it will be found on the other ſide *Sept.* the 13, So equal to *April* the 8 is *Auguſt* the 14. And the day equal to the 20 of *October* is *February* the Second.

Now theſe days are ſaid to be equal each to the other, in theſe reſpects; 1. in reſpect of the Suns Declination, it being on both the ſame. 2. Of the Suns Altitude, for what Altitude the Sun has on any hour on one, the ſame will be its Altitude on the ſame hour on the other. 3. The Time of the Suns Riſing and Setting is on both the ſame. 4. They are equal in length both of Day and Night.

A Table

A Table ſhewing the Latitudes of moſt of the Principal Places in every Shire throughout England *and* Wales.

Shires.	*Places Names.*	*d.*	*m.*
Angleſey,	Beaumaris,	53	27
	Holy-head,	53	33
Berkſhire,	Abington,	51	42
	Newbery,	51	25
	Reading.	51	28
Bedfordſhire,	Bedford,	52	09
	Dunſtable.	51	53
Brecknockſhire,	Bealt,	52	12
	Brecknock.	52	04
Buckinghamſhire,	Alesbury,	51	45
	Buckingham.	52	00
Cambridgſhire,	Cambridge,	52	06
	Ely.	52	30
Cardiganſhire,	Aberiſtwith.	52	35
	Cardigan.	52	20
Carmarthenſhire,	Carmarthen,	51	58
	Kidwelley.	51	50
Carnarvonſhire,	Arberconway,	53	30
	Bangor,	53	21
	Carnarvon.	53	18
Cheſhire,	Cheſter,	53	15
	Nantwich.	53	03

Shires.	*Places Names.*	*d.*	*m.*
Clamorganſhire,	Cardiff,	51	30
	Landaff.	51	34
Cornwall,	Fallmouth,	50	20
	The Lizard,	50	10
	Truro.	50	25
Cumberland,	Carliſle,	55	00
	Cockermouth.	54	45
Derbyſhire,	Cheſterfield,	53	20
	Derby.	53	00
Denbighſhire,	Denbigh,	53	18
	Ruthyn.	53	12
Devonſhire,	Dartmouth,	50	20
	Exeter,	50	41
	Plymouth.	50	30
Dorſet ſhire,	Dorcheſter,	50	40
	Shaftsbury,	50	58
	Weymouth,	50	32
Durham,	Aukland,	54	45
	Durham.	54	50
Eſſex,	Colcheſter,	52	00
	Harwich.	52	05
Flintſhire,	St. Aſaph,	53	25
	Flint.	53	20
Glouceſterſhire,	Glouceſter,	51	56
	Tewxbury.	52	15

Shires.	*Places Names.*	*d.*	*m.*
Hampſhire,	Portſmouth,	50	45
	Southampton,	50	54
	Wincheſter.	51	03
Hertfordſhire,	Hertford,	51	50
	Ware.	51	48
Herefordſhire,	Hereford,	52	12
	Lemſter.	52	24
Huntingtonſhire,	Huntington,	52	15
	St. Ives.	52	20
Iſles of	Gernſey,	49	38
	Jerſey,	49	28
	Man, Douglas,	54	25
	Wight, Newport.	50	45
Kent,	Canterbury,	51	15
	Dover,	51	25
	Rocheſter.	51	30
Lancaſhire,	Lancaſter.	54	15
	Mancheſter,	53	39
	Preſton.	53	55
Leiceſterſhire,	Harborough,	52	33
	Leiceſter,	52	40
Lincolnſhire,	Boſton,	53	06
	Lincoln,	53	16
	Stamford.	52	48
Merionethſhire,	Bala,	52	57
	Harlech.	53	00

Shires.	*Places names.*	*d.*	*m.*
Middleſex,	LONDON,	51	32
	Stanes,	51	30
	Uxbridge.	51	35
Monmouthſhire.	Chepſtow,	51	42
	Monmouth.	51	54
Montgomeryſhire.	Montgomery,	52	40
	Welchpool.	52	50
Norfolk,	Linn,	52	52
	Norwich,	52	44
	Yarmouth.	52	40
Northamptonſhire.	Northampton,	52	15
	Peterborough.	52	38
Northumberland,	Barwick,	55	50
	Newcaſtle.	55	03
Nottinghamſhire,	Nottingham,	53	00
	Workenſope.	53	25
Oxfordſhire,	Banbury,	51	57
	Oxford.	51	45
Pembrookſhire,	St. Davids,	52	00
	Pembrook.	51	48
Radnorſhire.	Preſtein,	52	30
	Radnor.	52	25
Rutland,	Okeham,	52	43
	Uppingham.	52	38

Shires.	*Places Names.*	*d.*	*m.*
Shropſhire,	Ludlow,	52	28
	Shrewsbury.	52	48
Somerſetſhire,	Bath,	51	20
	Briſtoll.	51	30
Staffordſhire.	Lichfield,	52	48
	Stafford.	52	52
Suffolk,	St. Edm. Bury,	52	22
	Ipſwich.	52	20
Surrey,	Guilford.	51	14
Suſſex,	Chicheſter,	50	49
	Lewis.	50	46
Warwickſhire,	Coventry,	52	32
	Warwick.	52	28
Weſtmoreland,	Apleby,	54	40
	Kendal.	54	24
Wiltſhire,	Marlborough,	51	25
	Malmsbury,	51	35
	Salisbury,	51	04
Worceſterſhire,	Kidderminſter	52	28
	Worceſter.	52	15
Yorkſhire,	Bridlington,	54	50
	Doncaſter,	53	38
	Hull,	53	48
	Leeds,	53	50
	York.	54	02

The Latitudes of the moſt Eminent places in Scotland.

Places names.	*d.*	*m.*
Aberdeen.	57	06
St. Andrews.	56	24
Barwick.	55	50
Dunblain.	56	20
Dunbriton.	56	10
Dunbar.	56	03
Dundee.	56	31
Dunfrees.	55	03
Edenburgh.	56	04
Fair-head.	58	43
Glaſcow.	56	05
Irwin.	55	50
Iſles of Orkney.	58	50
Kaithneſs.	57	48
Larnack.	55	51
Montroſs.	56	44
Nairn.	57	30
Perth or St. Johns Town.	56	32
Sterlin.	56	15
Withern.	54	57

The Latitudes of the moſt Eminent places in Ireland.

Places names,	*d.*	*m.*
Armagh.	54	23
Athloon.	53	21
Bantry.	51	30
Belfaſt.	54	41
Caſhell.	52	24
Caſherlaſh.	52	46
Clare.	52	44
Corke.	51	43
Craven.	54	01
Droughdagh.	53	44
Dublin.	53	20
Dundalk.	54	02
Dungarvan.	51	57
Dunnagall.	54	40
Galloway.	53	12
James Town.	53	53
Kildare.	53	08
Kilkenny.	52	34
Kingſail.	51	30
Knockfergus.	54	50
Limrick.	52	33
Londonderry.	55	04
Longford.	53	42
Slego.	54	17
Waterford.	52	09
Wexford.	52	17

How to Place an Horizontal Dyal *upon a levell Plane, and to find the Meridian ſeveral wayes.*

1. PRepare a ſmooth board or Stone, and place it truly Horizontal or levell, which may be done with ſuch an Inſtrument as the Artificers call a *Plumb-Rule*, or otherwiſe, then find the hour of the day by ſuch an Inſtrument as is before deſcribed, or by ſome other as true, or having a good *Watch* go to ſome *Sun-Dyal* that you know to go true, and ſet the *Watch* by it, afterwards turn the Dial (which you are to place) about, untill it ſhews the ſame hour with your Inſtrument or *Watch*, and there faſten it.

2. Or having prepared your plain as before, near the middle of it ſet up a wire which ſhall ſtand exactly perpendicular or upright, and the Sun Shining clear, obſerve a little before Noon when the ſhadow of the wire is at the ſhorteſt, and there make a point, and through that point and the center where the wire ſtood draw a line, upon which place the 12 a Clock line of your Dyal, and fix it.

3. And which is better, near the middle of your Plain chooſe a point as a center, and thereon

thereon deſcribe a Circle of a convenient bigneſs, and erect a wire at Right Angles to your plain as before, then obſerve in the forenoon when the ſhadow of the top of the Pin juſt toucheth the Circle, and there make a mark, and again in the Afternoon watch when the ſhadow of the top of the Pin juſt toucheth the Circle, and there make another Mark, then with a pair of Compaſſes divide the ſpace between thoſe two Markes into two equal parts, and there make a third Mark, through this laſt point and the center of the Circle where the wire ſtood, draw a line and it ſhall be a true Meridian-line. This laſt concluſion may be done with more eaſe, if there be ſeveral Circles deſcribed one within another on the ſame center, alſo then you may make ſeveral obſervations for the doing it with more certainty.

4. The Meridian may be found by the help of a good magnetical needle, well made and fitted to a ſquare Box, if in the uſeing of it there be an allowance made for the Variation, the uſe of which is ſo plain, even to thoſe that have but ſeen them, that I think it needleſs here to treat of.

I ſhall ſet down only two ways more, which will require more knowledge in the Mathematicks

maticks than any of the Former, and ſo conclude. The firſt is in *Dary's Miſſcellanies*, page 22, thus.

1. Let a piece of Mettal or Wood be made a true Plain, then in ſome convenient point thereof (taken as a Center,) erect a Gnomon of ſufficient length at right angles to the plain, this done, fix the Plain truly Horizontal; ſecondly if you take the Suns Co-altitude (that is his diſtance from the *Zenith*) 3 ſeveral times in one day, and according to the Stereographick Projection having a line of Tangents by you ſet off from the center of your plain or foot of the Gnomon, the Tangent of half each arch upon his reſpective Azimuth or Shadow (continued if need be) made by the Gnomon, at that Inſtant when the Co-altitude is taken, ſo ſhall you inſert three points upon the plain. Thirdly if you find out the Center to thoſe 3 inſerted points, then a right line infinitely extended by this Center found and the foot of the Gnomon or the Center of the plain, is the true Meridian line.

2. The other way, is by the help of the Suns Azimuth, and it is hinted in moſt Books of Dyalling, thus, 1. Your plain being prepared as before, hold up a ſtring and Plummet, ſo that the ſhadow of the ſtring may fall a croſs

croſs an aſſigned point in the plain, and in the ſame line of ſhadow make another point at a convenient diſtance from the firſt, then through theſe two points draw a right line, ſecondly at the ſame inſtant get the Suns Azimuth or Horizontal diſtance from the ſouth part of the Meridian, and having a line of chords by you, ſet off the angle of the Azimuth from the aſſigned point, either on the weſt ſide of the line drawn, if your obſervation be made in the Morning, or on the eaſt ſide if your obſervation be in the Afternoon, and draw the line. Thirdly this laſt line ſo drawn ſhall be in the true Meridian.

FINIS.

ERRATA.

Page 4 *line* 9 *read* ſubivided and numbered. *Page* 8 *line* 15 *dele* the. *Page* 13 *and* 14 *read* Complement. *Page* 17 *line* 14 *read* Heavens. *Page* 19 *line* 14 *read* length.